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Measurement of the Υ(1S), Υ(2S), and Υ(3S) polarizations in pp collisions at $\sqrt{s} = 7\,\text{TeV}$

—Supplemental Material—

The CMS Collaboration

Abstract

Tables

Table 1: λ_ϑ in the CS frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.097	$^{+0.072}_{-0.079}$	$^{+0.146}_{-0.152}$	$^{+0.219}_{-0.226}$	$^{+0.033}_{-0.032}$
	12–16	-0.013	$^{+0.072}_{-0.077}$	$^{+0.145}_{-0.154}$	$^{+0.221}_{-0.226}$	$^{+0.031}_{-0.030}$
	16–20	-0.063	$^{+0.066}_{-0.070}$	$^{+0.133}_{-0.138}$	$^{+0.201}_{-0.206}$	$^{+0.035}_{-0.034}$
	20–30	-0.022	$^{+0.064}_{-0.070}$	$^{+0.132}_{-0.135}$	$^{+0.197}_{-0.199}$	$^{+0.038}_{-0.038}$
	30–50	-0.134	$^{+0.079}_{-0.084}$	$^{+0.165}_{-0.165}$	$^{+0.255}_{-0.242}$	$^{+0.063}_{-0.063}$
0.6–1.2	10–12	$+0.039$	$^{+0.079}_{-0.087}$	$^{+0.162}_{-0.170}$	$^{+0.240}_{-0.244}$	$^{+0.037}_{-0.037}$
	12–16	-0.071	$^{+0.061}_{-0.068}$	$^{+0.126}_{-0.133}$	$^{+0.194}_{-0.198}$	$^{+0.028}_{-0.028}$
	16–20	-0.080	$^{+0.062}_{-0.068}$	$^{+0.128}_{-0.134}$	$^{+0.194}_{-0.197}$	$^{+0.035}_{-0.035}$
	20–30	-0.124	$^{+0.060}_{-0.065}$	$^{+0.124}_{-0.130}$	$^{+0.188}_{-0.190}$	$^{+0.035}_{-0.034}$
	30–50	-0.131	$^{+0.077}_{-0.083}$	$^{+0.160}_{-0.161}$	$^{+0.246}_{-0.235}$	$^{+0.065}_{-0.060}$

Table 2: λ_φ in the CS frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.054$	$^{+0.077}_{-0.086}$	$^{+0.153}_{-0.170}$	$^{+0.233}_{-0.250}$	$^{+0.040}_{-0.053}$
	12–16	-0.009	$^{+0.070}_{-0.079}$	$^{+0.144}_{-0.154}$	$^{+0.219}_{-0.228}$	$^{+0.035}_{-0.042}$
	16–20	-0.004	$^{+0.053}_{-0.060}$	$^{+0.105}_{-0.119}$	$^{+0.160}_{-0.177}$	$^{+0.036}_{-0.045}$
	20–30	-0.025	$^{+0.043}_{-0.049}$	$^{+0.087}_{-0.095}$	$^{+0.128}_{-0.143}$	$^{+0.035}_{-0.041}$
	30–50	$+0.037$	$^{+0.055}_{-0.066}$	$^{+0.111}_{-0.125}$	$^{+0.164}_{-0.191}$	$^{+0.047}_{-0.058}$
0.6–1.2	10–12	-0.077	$^{+0.069}_{-0.077}$	$^{+0.134}_{-0.145}$	$^{+0.196}_{-0.210}$	$^{+0.038}_{-0.045}$
	12–16	-0.030	$^{+0.044}_{-0.050}$	$^{+0.090}_{-0.098}$	$^{+0.135}_{-0.147}$	$^{+0.028}_{-0.034}$
	16–20	-0.004	$^{+0.040}_{-0.049}$	$^{+0.084}_{-0.094}$	$^{+0.127}_{-0.143}$	$^{+0.034}_{-0.041}$
	20–30	-0.012	$^{+0.041}_{-0.048}$	$^{+0.086}_{-0.095}$	$^{+0.129}_{-0.140}$	$^{+0.032}_{-0.038}$
	30–50	$+0.065$	$^{+0.049}_{-0.059}$	$^{+0.100}_{-0.115}$	$^{+0.148}_{-0.172}$	$^{+0.047}_{-0.057}$

Table 3: $\lambda_{\vartheta\varphi}$ in the CS frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.043	$^{+0.031}_{-0.035}$	$^{+0.063}_{-0.067}$	$^{+0.097}_{-0.099}$	$^{+0.023}_{-0.025}$
	12–16	-0.053	$^{+0.028}_{-0.031}$	$^{+0.057}_{-0.061}$	$^{+0.088}_{-0.090}$	$^{+0.016}_{-0.018}$
	16–20	-0.026	$^{+0.028}_{-0.031}$	$^{+0.057}_{-0.061}$	$^{+0.086}_{-0.090}$	$^{+0.019}_{-0.020}$
	20–30	$+0.019$	$^{+0.025}_{-0.028}$	$^{+0.051}_{-0.054}$	$^{+0.078}_{-0.081}$	$^{+0.019}_{-0.021}$
	30–50	-0.028	$^{+0.035}_{-0.040}$	$^{+0.073}_{-0.078}$	$^{+0.110}_{-0.114}$	$^{+0.034}_{-0.037}$
0.6–1.2	10–12	-0.071	$^{+0.043}_{-0.046}$	$^{+0.086}_{-0.091}$	$^{+0.132}_{-0.132}$	$^{+0.027}_{-0.029}$
	12–16	-0.052	$^{+0.032}_{-0.035}$	$^{+0.063}_{-0.067}$	$^{+0.097}_{-0.098}$	$^{+0.018}_{-0.020}$
	16–20	-0.014	$^{+0.029}_{-0.031}$	$^{+0.058}_{-0.062}$	$^{+0.088}_{-0.090}$	$^{+0.021}_{-0.022}$
	20–30	-0.021	$^{+0.025}_{-0.028}$	$^{+0.052}_{-0.055}$	$^{+0.078}_{-0.081}$	$^{+0.020}_{-0.022}$
	30–50	-0.029	$^{+0.039}_{-0.042}$	$^{+0.079}_{-0.082}$	$^{+0.117}_{-0.122}$	$^{+0.035}_{-0.038}$

Table 4: $\tilde{\lambda}$ in the CS frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.081$	$^{+0.185}_{-0.204}$	$^{+0.384}_{-0.403}$	$^{+0.583}_{-0.592}$	$^{+0.109}_{-0.113}$
	12–16	-0.053	$^{+0.158}_{-0.167}$	$^{+0.316}_{-0.333}$	$^{+0.483}_{-0.491}$	$^{+0.073}_{-0.074}$
	16–20	-0.080	$^{+0.124}_{-0.131}$	$^{+0.255}_{-0.262}$	$^{+0.380}_{-0.387}$	$^{+0.081}_{-0.083}$
	20–30	-0.092	$^{+0.097}_{-0.106}$	$^{+0.203}_{-0.207}$	$^{+0.305}_{-0.303}$	$^{+0.078}_{-0.079}$
	30–50	-0.039	$^{+0.152}_{-0.140}$	$^{+0.302}_{-0.274}$	$^{+0.461}_{-0.399}$	$^{+0.142}_{-0.129}$
0.6–1.2	10–12	-0.176	$^{+0.137}_{-0.147}$	$^{+0.279}_{-0.290}$	$^{+0.414}_{-0.418}$	$^{+0.086}_{-0.088}$
	12–16	-0.128	$^{+0.107}_{-0.121}$	$^{+0.221}_{-0.229}$	$^{+0.336}_{-0.343}$	$^{+0.067}_{-0.070}$
	16–20	-0.089	$^{+0.104}_{-0.112}$	$^{+0.215}_{-0.218}$	$^{+0.321}_{-0.317}$	$^{+0.081}_{-0.083}$
	20–30	-0.144	$^{+0.103}_{-0.113}$	$^{+0.217}_{-0.222}$	$^{+0.326}_{-0.325}$	$^{+0.080}_{-0.079}$
	30–50	$+0.061$	$^{+0.161}_{-0.155}$	$^{+0.331}_{-0.293}$	$^{+0.510}_{-0.423}$	$^{+0.159}_{-0.143}$

Table 5: λ_ϑ in the HX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.209$	$^{+0.159}_{-0.175}$	$^{+0.330}_{-0.346}$	$^{+0.492}_{-0.509}$	$^{+0.104}_{-0.116}$
	12–16	$+0.133$	$^{+0.134}_{-0.146}$	$^{+0.270}_{-0.283}$	$^{+0.407}_{-0.419}$	$^{+0.071}_{-0.076}$
	16–20	$+0.064$	$^{+0.115}_{-0.127}$	$^{+0.236}_{-0.241}$	$^{+0.356}_{-0.362}$	$^{+0.077}_{-0.080}$
	20–30	$+0.004$	$^{+0.090}_{-0.099}$	$^{+0.185}_{-0.194}$	$^{+0.279}_{-0.284}$	$^{+0.065}_{-0.072}$
	30–50	$+0.166$	$^{+0.125}_{-0.128}$	$^{+0.261}_{-0.252}$	$^{+0.397}_{-0.368}$	$^{+0.111}_{-0.110}$
0.6–1.2	10–12	$+0.032$	$^{+0.127}_{-0.143}$	$^{+0.263}_{-0.271}$	$^{+0.398}_{-0.399}$	$^{+0.083}_{-0.087}$
	12–16	$+0.071$	$^{+0.098}_{-0.105}$	$^{+0.197}_{-0.203}$	$^{+0.295}_{-0.307}$	$^{+0.060}_{-0.066}$
	16–20	$+0.033$	$^{+0.088}_{-0.099}$	$^{+0.184}_{-0.190}$	$^{+0.280}_{-0.281}$	$^{+0.068}_{-0.072}$
	20–30	$+0.066$	$^{+0.087}_{-0.094}$	$^{+0.178}_{-0.185}$	$^{+0.273}_{-0.276}$	$^{+0.065}_{-0.071}$
	30–50	$+0.214$	$^{+0.122}_{-0.126}$	$^{+0.259}_{-0.251}$	$^{+0.390}_{-0.362}$	$^{+0.111}_{-0.113}$

Table 6: λ_φ in the HX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.042	$^{+0.032}_{-0.035}$	$^{+0.066}_{-0.069}$	$^{+0.099}_{-0.103}$	$^{+0.011}_{-0.012}$
	12–16	-0.034	$^{+0.023}_{-0.025}$	$^{+0.046}_{-0.049}$	$^{+0.070}_{-0.073}$	$^{+0.008}_{-0.009}$
	16–20	-0.045	$^{+0.023}_{-0.025}$	$^{+0.047}_{-0.049}$	$^{+0.070}_{-0.072}$	$^{+0.012}_{-0.013}$
	20–30	-0.025	$^{+0.020}_{-0.023}$	$^{+0.041}_{-0.043}$	$^{+0.062}_{-0.064}$	$^{+0.014}_{-0.015}$
	30–50	-0.061	$^{+0.031}_{-0.036}$	$^{+0.064}_{-0.068}$	$^{+0.097}_{-0.101}$	$^{+0.030}_{-0.033}$
0.6–1.2	10–12	-0.072	$^{+0.025}_{-0.028}$	$^{+0.053}_{-0.056}$	$^{+0.079}_{-0.082}$	$^{+0.016}_{-0.018}$
	12–16	-0.072	$^{+0.021}_{-0.024}$	$^{+0.043}_{-0.047}$	$^{+0.066}_{-0.068}$	$^{+0.012}_{-0.014}$
	16–20	-0.048	$^{+0.023}_{-0.025}$	$^{+0.047}_{-0.050}$	$^{+0.072}_{-0.074}$	$^{+0.015}_{-0.016}$
	20–30	-0.076	$^{+0.025}_{-0.027}$	$^{+0.050}_{-0.054}$	$^{+0.077}_{-0.079}$	$^{+0.015}_{-0.017}$
	30–50	-0.043	$^{+0.037}_{-0.041}$	$^{+0.073}_{-0.077}$	$^{+0.111}_{-0.115}$	$^{+0.032}_{-0.035}$

Table 7: $\lambda_{\vartheta\varphi}$ in the HX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.006$	$^{+0.040}_{-0.045}$	$^{+0.082}_{-0.089}$	$^{+0.124}_{-0.133}$	$^{+0.031}_{-0.036}$
	12–16	$+0.042$	$^{+0.031}_{-0.034}$	$^{+0.065}_{-0.067}$	$^{+0.096}_{-0.101}$	$^{+0.020}_{-0.021}$
	16–20	$+0.006$	$^{+0.028}_{-0.031}$	$^{+0.058}_{-0.062}$	$^{+0.087}_{-0.090}$	$^{+0.020}_{-0.022}$
	20–30	-0.020	$^{+0.026}_{-0.029}$	$^{+0.053}_{-0.055}$	$^{+0.079}_{-0.083}$	$^{+0.020}_{-0.022}$
	30–50	$+0.017$	$^{+0.038}_{-0.044}$	$^{+0.077}_{-0.084}$	$^{+0.117}_{-0.121}$	$^{+0.036}_{-0.041}$
0.6–1.2	10–12	$+0.091$	$^{+0.043}_{-0.046}$	$^{+0.085}_{-0.091}$	$^{+0.128}_{-0.133}$	$^{+0.030}_{-0.033}$
	12–16	$+0.012$	$^{+0.034}_{-0.038}$	$^{+0.069}_{-0.073}$	$^{+0.104}_{-0.108}$	$^{+0.022}_{-0.025}$
	16–20	-0.012	$^{+0.033}_{-0.037}$	$^{+0.067}_{-0.070}$	$^{+0.100}_{-0.104}$	$^{+0.024}_{-0.028}$
	20–30	-0.009	$^{+0.031}_{-0.035}$	$^{+0.064}_{-0.068}$	$^{+0.096}_{-0.100}$	$^{+0.023}_{-0.026}$
	30–50	-0.002	$^{+0.044}_{-0.051}$	$^{+0.090}_{-0.097}$	$^{+0.134}_{-0.143}$	$^{+0.039}_{-0.045}$

Table 8: $\tilde{\lambda}$ in the HX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.084$	$^{+0.187}_{-0.210}$	$^{+0.385}_{-0.408}$	$^{+0.583}_{-0.597}$	$^{+0.103}_{-0.108}$
	12–16	$+0.028$	$^{+0.158}_{-0.177}$	$^{+0.326}_{-0.335}$	$^{+0.493}_{-0.503}$	$^{+0.073}_{-0.076}$
	16–20	-0.061	$^{+0.127}_{-0.138}$	$^{+0.256}_{-0.267}$	$^{+0.392}_{-0.396}$	$^{+0.081}_{-0.082}$
	20–30	-0.067	$^{+0.098}_{-0.108}$	$^{+0.202}_{-0.206}$	$^{+0.311}_{-0.310}$	$^{+0.075}_{-0.078}$
	30–50	-0.013	$^{+0.146}_{-0.143}$	$^{+0.304}_{-0.281}$	$^{+0.463}_{-0.404}$	$^{+0.135}_{-0.132}$
0.6–1.2	10–12	-0.159	$^{+0.136}_{-0.150}$	$^{+0.278}_{-0.285}$	$^{+0.414}_{-0.420}$	$^{+0.084}_{-0.090}$
	12–16	-0.101	$^{+0.102}_{-0.114}$	$^{+0.213}_{-0.224}$	$^{+0.324}_{-0.330}$	$^{+0.063}_{-0.068}$
	16–20	-0.094	$^{+0.101}_{-0.110}$	$^{+0.206}_{-0.216}$	$^{+0.317}_{-0.316}$	$^{+0.078}_{-0.082}$
	20–30	-0.144	$^{+0.104}_{-0.112}$	$^{+0.214}_{-0.217}$	$^{+0.325}_{-0.323}$	$^{+0.075}_{-0.079}$
	30–50	$+0.083$	$^{+0.156}_{-0.154}$	$^{+0.327}_{-0.300}$	$^{+0.499}_{-0.431}$	$^{+0.150}_{-0.141}$

Table 9: λ_ϑ in the PX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.189$	$^{+0.152}_{-0.169}$	$^{+0.321}_{-0.338}$	$^{+0.482}_{-0.490}$	$^{+0.109}_{-0.120}$
	12–16	$+0.021$	$^{+0.129}_{-0.141}$	$^{+0.264}_{-0.277}$	$^{+0.406}_{-0.412}$	$^{+0.073}_{-0.077}$
	16–20	$+0.047$	$^{+0.109}_{-0.122}$	$^{+0.227}_{-0.234}$	$^{+0.339}_{-0.346}$	$^{+0.075}_{-0.083}$
	20–30	-0.012	$^{+0.085}_{-0.095}$	$^{+0.181}_{-0.186}$	$^{+0.271}_{-0.276}$	$^{+0.066}_{-0.069}$
	30–50	$+0.146$	$^{+0.127}_{-0.132}$	$^{+0.256}_{-0.247}$	$^{+0.393}_{-0.363}$	$^{+0.108}_{-0.110}$
0.6–1.2	10–12	-0.107	$^{+0.122}_{-0.132}$	$^{+0.245}_{-0.256}$	$^{+0.362}_{-0.373}$	$^{+0.073}_{-0.076}$
	12–16	$+0.000$	$^{+0.096}_{-0.104}$	$^{+0.198}_{-0.207}$	$^{+0.301}_{-0.309}$	$^{+0.059}_{-0.062}$
	16–20	$+0.048$	$^{+0.090}_{-0.101}$	$^{+0.188}_{-0.194}$	$^{+0.281}_{-0.282}$	$^{+0.071}_{-0.075}$
	20–30	$+0.058$	$^{+0.092}_{-0.101}$	$^{+0.183}_{-0.192}$	$^{+0.279}_{-0.283}$	$^{+0.067}_{-0.071}$
	30–50	$+0.199$	$^{+0.124}_{-0.128}$	$^{+0.253}_{-0.250}$	$^{+0.389}_{-0.360}$	$^{+0.112}_{-0.114}$

Table 10: λ_φ in the PX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.030	$^{+0.029}_{-0.032}$	$^{+0.059}_{-0.063}$	$^{+0.090}_{-0.094}$	$^{+0.010}_{-0.011}$
	12–16	-0.022	$^{+0.022}_{-0.024}$	$^{+0.045}_{-0.048}$	$^{+0.068}_{-0.071}$	$^{+0.008}_{-0.009}$
	16–20	-0.044	$^{+0.021}_{-0.024}$	$^{+0.045}_{-0.047}$	$^{+0.067}_{-0.070}$	$^{+0.011}_{-0.012}$
	20–30	-0.027	$^{+0.019}_{-0.022}$	$^{+0.040}_{-0.042}$	$^{+0.060}_{-0.062}$	$^{+0.014}_{-0.014}$
	30–50	-0.056	$^{+0.032}_{-0.034}$	$^{+0.063}_{-0.069}$	$^{+0.095}_{-0.101}$	$^{+0.030}_{-0.032}$
0.6–1.2	10–12	-0.021	$^{+0.024}_{-0.027}$	$^{+0.050}_{-0.053}$	$^{+0.076}_{-0.078}$	$^{+0.011}_{-0.013}$
	12–16	-0.053	$^{+0.020}_{-0.023}$	$^{+0.042}_{-0.044}$	$^{+0.064}_{-0.066}$	$^{+0.009}_{-0.010}$
	16–20	-0.046	$^{+0.020}_{-0.023}$	$^{+0.042}_{-0.044}$	$^{+0.064}_{-0.066}$	$^{+0.013}_{-0.014}$
	20–30	-0.071	$^{+0.024}_{-0.027}$	$^{+0.049}_{-0.051}$	$^{+0.073}_{-0.076}$	$^{+0.015}_{-0.015}$
	30–50	-0.037	$^{+0.035}_{-0.038}$	$^{+0.071}_{-0.074}$	$^{+0.105}_{-0.110}$	$^{+0.032}_{-0.035}$

Table 11: $\lambda_{\vartheta\varphi}$ in the PX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.069$	$^{+0.033}_{-0.037}$	$^{+0.069}_{-0.074}$	$^{+0.104}_{-0.109}$	$^{+0.028}_{-0.031}$
	12–16	$+0.055$	$^{+0.028}_{-0.030}$	$^{+0.058}_{-0.061}$	$^{+0.087}_{-0.091}$	$^{+0.017}_{-0.019}$
	16–20	$+0.030$	$^{+0.028}_{-0.031}$	$^{+0.058}_{-0.060}$	$^{+0.086}_{-0.088}$	$^{+0.020}_{-0.021}$
	20–30	-0.017	$^{+0.025}_{-0.028}$	$^{+0.051}_{-0.054}$	$^{+0.078}_{-0.081}$	$^{+0.019}_{-0.021}$
	30–50	$+0.034$	$^{+0.039}_{-0.042}$	$^{+0.078}_{-0.080}$	$^{+0.118}_{-0.119}$	$^{+0.037}_{-0.039}$
0.6–1.2	10–12	$+0.074$	$^{+0.045}_{-0.049}$	$^{+0.093}_{-0.098}$	$^{+0.139}_{-0.144}$	$^{+0.029}_{-0.032}$
	12–16	$+0.053$	$^{+0.031}_{-0.036}$	$^{+0.066}_{-0.068}$	$^{+0.098}_{-0.101}$	$^{+0.020}_{-0.021}$
	16–20	$+0.016$	$^{+0.029}_{-0.033}$	$^{+0.060}_{-0.063}$	$^{+0.090}_{-0.094}$	$^{+0.022}_{-0.024}$
	20–30	$+0.025$	$^{+0.026}_{-0.029}$	$^{+0.056}_{-0.059}$	$^{+0.084}_{-0.087}$	$^{+0.021}_{-0.023}$
	30–50	$+0.040$	$^{+0.042}_{-0.046}$	$^{+0.088}_{-0.091}$	$^{+0.131}_{-0.132}$	$^{+0.038}_{-0.042}$

Table 12: $\tilde{\lambda}$ in the PX frame for the Υ(1S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.087$	$^{+0.169}_{-0.188}$	$^{+0.348}_{-0.357}$	$^{+0.526}_{-0.536}$	$^{+0.105}_{-0.113}$
	12–16	-0.047	$^{+0.147}_{-0.160}$	$^{+0.301}_{-0.314}$	$^{+0.454}_{-0.467}$	$^{+0.071}_{-0.075}$
	16–20	-0.070	$^{+0.118}_{-0.135}$	$^{+0.245}_{-0.255}$	$^{+0.371}_{-0.381}$	$^{+0.078}_{-0.084}$
	20–30	-0.081	$^{+0.097}_{-0.104}$	$^{+0.201}_{-0.202}$	$^{+0.299}_{-0.300}$	$^{+0.073}_{-0.075}$
	30–50	-0.017	$^{+0.144}_{-0.146}$	$^{+0.297}_{-0.277}$	$^{+0.457}_{-0.408}$	$^{+0.139}_{-0.132}$
0.6–1.2	10–12	-0.163	$^{+0.136}_{-0.147}$	$^{+0.271}_{-0.281}$	$^{+0.405}_{-0.409}$	$^{+0.085}_{-0.088}$
	12–16	-0.131	$^{+0.107}_{-0.117}$	$^{+0.213}_{-0.223}$	$^{+0.324}_{-0.334}$	$^{+0.063}_{-0.070}$
	16–20	-0.080	$^{+0.099}_{-0.106}$	$^{+0.204}_{-0.212}$	$^{+0.315}_{-0.312}$	$^{+0.078}_{-0.080}$
	20–30	-0.140	$^{+0.105}_{-0.110}$	$^{+0.209}_{-0.214}$	$^{+0.320}_{-0.318}$	$^{+0.078}_{-0.078}$
	30–50	$+0.080$	$^{+0.159}_{-0.154}$	$^{+0.323}_{-0.294}$	$^{+0.502}_{-0.427}$	$^{+0.149}_{-0.143}$

Table 13: λ_ϑ in the CS frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	−0.137	$^{+0.087}_{-0.093}$	$^{+0.175}_{-0.181}$	$^{+0.263}_{-0.264}$	$^{+0.047}_{-0.041}$
	12–16	−0.189	$^{+0.079}_{-0.085}$	$^{+0.159}_{-0.165}$	$^{+0.239}_{-0.245}$	$^{+0.034}_{-0.033}$
	16–20	−0.103	$^{+0.077}_{-0.084}$	$^{+0.158}_{-0.161}$	$^{+0.243}_{-0.238}$	$^{+0.049}_{-0.045}$
	20–30	−0.129	$^{+0.072}_{-0.077}$	$^{+0.148}_{-0.150}$	$^{+0.225}_{-0.222}$	$^{+0.049}_{-0.047}$
	30–50	−0.214	$^{+0.098}_{-0.098}$	$^{+0.201}_{-0.186}$	$^{+0.310}_{-0.268}$	$^{+0.085}_{-0.076}$
0.6–1.2	10–12	−0.090	$^{+0.110}_{-0.120}$	$^{+0.209}_{-0.219}$	$^{+0.309}_{-0.304}$	$^{+0.053}_{-0.051}$
	12–16	−0.135	$^{+0.075}_{-0.080}$	$^{+0.153}_{-0.158}$	$^{+0.231}_{-0.232}$	$^{+0.040}_{-0.039}$
	16–20	−0.092	$^{+0.082}_{-0.087}$	$^{+0.166}_{-0.167}$	$^{+0.250}_{-0.243}$	$^{+0.056}_{-0.053}$
	20–30	−0.259	$^{+0.066}_{-0.074}$	$^{+0.139}_{-0.140}$	$^{+0.209}_{-0.210}$	$^{+0.044}_{-0.043}$
	30–50	−0.200	$^{+0.098}_{-0.098}$	$^{+0.201}_{-0.185}$	$^{+0.309}_{-0.273}$	$^{+0.082}_{-0.078}$

Table 14: λ_φ in the CS frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	+0.131	$^{+0.103}_{-0.117}$	$^{+0.208}_{-0.227}$	$^{+0.301}_{-0.337}$	$^{+0.051}_{-0.069}$
	12–16	+0.172	$^{+0.082}_{-0.095}$	$^{+0.168}_{-0.182}$	$^{+0.250}_{-0.268}$	$^{+0.039}_{-0.050}$
	16–20	+0.092	$^{+0.067}_{-0.078}$	$^{+0.133}_{-0.153}$	$^{+0.197}_{-0.227}$	$^{+0.046}_{-0.061}$
	20–30	+0.080	$^{+0.049}_{-0.061}$	$^{+0.102}_{-0.119}$	$^{+0.154}_{-0.180}$	$^{+0.044}_{-0.054}$
	30–50	+0.145	$^{+0.068}_{-0.080}$	$^{+0.135}_{-0.162}$	$^{+0.198}_{-0.243}$	$^{+0.060}_{-0.076}$
0.6–1.2	10–12	+0.040	$^{+0.100}_{-0.110}$	$^{+0.189}_{-0.204}$	$^{+0.265}_{-0.288}$	$^{+0.048}_{-0.060}$
	12–16	+0.034	$^{+0.063}_{-0.074}$	$^{+0.127}_{-0.138}$	$^{+0.188}_{-0.206}$	$^{+0.038}_{-0.050}$
	16–20	−0.027	$^{+0.061}_{-0.077}$	$^{+0.127}_{-0.149}$	$^{+0.186}_{-0.225}$	$^{+0.052}_{-0.066}$
	20–30	+0.151	$^{+0.046}_{-0.055}$	$^{+0.095}_{-0.107}$	$^{+0.145}_{-0.162}$	$^{+0.040}_{-0.047}$
	30–50	+0.121	$^{+0.063}_{-0.080}$	$^{+0.130}_{-0.158}$	$^{+0.190}_{-0.237}$	$^{+0.062}_{-0.077}$

Table 15: $\lambda_{\vartheta\varphi}$ in the CS frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty			stat. unc.
			68.3% CL	95.5% CL	99.7% CL	68.3% CL
0.0–0.6	10–12	-0.058	$^{+0.043}_{-0.048}$	$^{+0.088}_{-0.093}$	$^{+0.134}_{-0.138}$	$^{+0.033}_{-0.037}$
	12–16	-0.001	$^{+0.033}_{-0.037}$	$^{+0.069}_{-0.074}$	$^{+0.106}_{-0.108}$	$^{+0.024}_{-0.025}$
	16–20	-0.009	$^{+0.034}_{-0.039}$	$^{+0.072}_{-0.077}$	$^{+0.108}_{-0.112}$	$^{+0.028}_{-0.031}$
	20–30	-0.052	$^{+0.031}_{-0.036}$	$^{+0.066}_{-0.069}$	$^{+0.097}_{-0.101}$	$^{+0.028}_{-0.031}$
	30–50	-0.065	$^{+0.049}_{-0.055}$	$^{+0.098}_{-0.104}$	$^{+0.147}_{-0.156}$	$^{+0.046}_{-0.052}$
0.6–1.2	10–12	-0.062	$^{+0.059}_{-0.067}$	$^{+0.122}_{-0.127}$	$^{+0.182}_{-0.184}$	$^{+0.041}_{-0.045}$
	12–16	$+0.002$	$^{+0.040}_{-0.044}$	$^{+0.082}_{-0.084}$	$^{+0.122}_{-0.125}$	$^{+0.030}_{-0.032}$
	16–20	-0.043	$^{+0.039}_{-0.043}$	$^{+0.081}_{-0.084}$	$^{+0.122}_{-0.122}$	$^{+0.034}_{-0.036}$
	20–30	-0.059	$^{+0.032}_{-0.036}$	$^{+0.066}_{-0.070}$	$^{+0.101}_{-0.101}$	$^{+0.028}_{-0.031}$
	30–50	$+0.041$	$^{+0.052}_{-0.058}$	$^{+0.105}_{-0.110}$	$^{+0.157}_{-0.160}$	$^{+0.048}_{-0.052}$

Table 16: $\tilde{\lambda}$ in the CS frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty			stat. unc.
			68.3% CL	95.5% CL	99.7% CL	68.3% CL
0.0–0.6	10–12	$+0.293$	$^{+0.280}_{-0.301}$	$^{+0.563}_{-0.585}$	$^{+0.847}_{-0.841}$	$^{+0.174}_{-0.171}$
	12–16	$+0.299$	$^{+0.209}_{-0.219}$	$^{+0.417}_{-0.438}$	$^{+0.626}_{-0.637}$	$^{+0.122}_{-0.122}$
	16–20	$+0.153$	$^{+0.175}_{-0.184}$	$^{+0.354}_{-0.354}$	$^{+0.533}_{-0.515}$	$^{+0.138}_{-0.130}$
	20–30	$+0.092$	$^{+0.142}_{-0.143}$	$^{+0.284}_{-0.272}$	$^{+0.427}_{-0.400}$	$^{+0.123}_{-0.120}$
	30–50	$+0.204$	$^{+0.250}_{-0.205}$	$^{+0.496}_{-0.392}$	$^{+0.764}_{-0.579}$	$^{+0.237}_{-0.187}$
0.6–1.2	10–12	$+0.041$	$^{+0.225}_{-0.237}$	$^{+0.441}_{-0.443}$	$^{+0.647}_{-0.638}$	$^{+0.145}_{-0.138}$
	12–16	-0.007	$^{+0.151}_{-0.166}$	$^{+0.313}_{-0.321}$	$^{+0.468}_{-0.467}$	$^{+0.112}_{-0.110}$
	16–20	-0.168	$^{+0.152}_{-0.153}$	$^{+0.301}_{-0.295}$	$^{+0.457}_{-0.429}$	$^{+0.130}_{-0.123}$
	20–30	$+0.235$	$^{+0.158}_{-0.153}$	$^{+0.322}_{-0.301}$	$^{+0.486}_{-0.440}$	$^{+0.142}_{-0.136}$
	30–50	$+0.163$	$^{+0.249}_{-0.216}$	$^{+0.507}_{-0.413}$	$^{+0.776}_{-0.596}$	$^{+0.243}_{-0.203}$

Table 17: λ_ϑ in the HX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.381$	$^{+0.227}_{-0.251}$	$^{+0.460}_{-0.473}$	$^{+0.693}_{-0.706}$	$^{+0.165}_{-0.171}$
	12–16	$+0.459$	$^{+0.163}_{-0.186}$	$^{+0.341}_{-0.355}$	$^{+0.511}_{-0.524}$	$^{+0.115}_{-0.122}$
	16–20	$+0.288$	$^{+0.154}_{-0.164}$	$^{+0.312}_{-0.323}$	$^{+0.471}_{-0.473}$	$^{+0.125}_{-0.126}$
	20–30	$+0.240$	$^{+0.123}_{-0.131}$	$^{+0.254}_{-0.255}$	$^{+0.384}_{-0.379}$	$^{+0.107}_{-0.110}$
	30–50	$+0.432$	$^{+0.188}_{-0.185}$	$^{+0.390}_{-0.367}$	$^{+0.602}_{-0.529}$	$^{+0.177}_{-0.178}$
0.6–1.2	10–12	$+0.256$	$^{+0.219}_{-0.231}$	$^{+0.423}_{-0.435}$	$^{+0.607}_{-0.618}$	$^{+0.132}_{-0.136}$
	12–16	$+0.093$	$^{+0.130}_{-0.138}$	$^{+0.264}_{-0.272}$	$^{+0.391}_{-0.399}$	$^{+0.092}_{-0.097}$
	16–20	$+0.046$	$^{+0.131}_{-0.136}$	$^{+0.264}_{-0.269}$	$^{+0.397}_{-0.389}$	$^{+0.110}_{-0.111}$
	20–30	$+0.485$	$^{+0.129}_{-0.132}$	$^{+0.267}_{-0.255}$	$^{+0.404}_{-0.379}$	$^{+0.114}_{-0.115}$
	30–50	$+0.326$	$^{+0.175}_{-0.175}$	$^{+0.363}_{-0.345}$	$^{+0.559}_{-0.499}$	$^{+0.169}_{-0.167}$

Table 18: λ_φ in the HX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.031	$^{+0.040}_{-0.044}$	$^{+0.080}_{-0.086}$	$^{+0.120}_{-0.124}$	$^{+0.019}_{-0.021}$
	12–16	-0.040	$^{+0.028}_{-0.031}$	$^{+0.056}_{-0.059}$	$^{+0.084}_{-0.087}$	$^{+0.014}_{-0.016}$
	16–20	-0.017	$^{+0.027}_{-0.031}$	$^{+0.056}_{-0.059}$	$^{+0.084}_{-0.087}$	$^{+0.019}_{-0.021}$
	20–30	-0.043	$^{+0.026}_{-0.028}$	$^{+0.052}_{-0.056}$	$^{+0.078}_{-0.082}$	$^{+0.021}_{-0.023}$
	30–50	-0.056	$^{+0.045}_{-0.050}$	$^{+0.092}_{-0.097}$	$^{+0.139}_{-0.144}$	$^{+0.043}_{-0.047}$
0.6–1.2	10–12	-0.054	$^{+0.036}_{-0.042}$	$^{+0.074}_{-0.080}$	$^{+0.110}_{-0.120}$	$^{+0.029}_{-0.034}$
	12–16	-0.044	$^{+0.028}_{-0.032}$	$^{+0.057}_{-0.061}$	$^{+0.085}_{-0.091}$	$^{+0.021}_{-0.025}$
	16–20	-0.079	$^{+0.031}_{-0.034}$	$^{+0.062}_{-0.065}$	$^{+0.093}_{-0.096}$	$^{+0.024}_{-0.026}$
	20–30	-0.076	$^{+0.032}_{-0.034}$	$^{+0.064}_{-0.068}$	$^{+0.098}_{-0.100}$	$^{+0.024}_{-0.027}$
	30–50	-0.037	$^{+0.049}_{-0.054}$	$^{+0.099}_{-0.106}$	$^{+0.150}_{-0.155}$	$^{+0.046}_{-0.051}$

Table 19: $\lambda_{\vartheta\varphi}$ in the HX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.014	$^{+0.061}_{-0.069}$	$^{+0.126}_{-0.134}$	$^{+0.188}_{-0.196}$	$^{+0.050}_{-0.055}$
	12–16	-0.078	$^{+0.042}_{-0.049}$	$^{+0.089}_{-0.096}$	$^{+0.134}_{-0.143}$	$^{+0.032}_{-0.036}$
	16–20	-0.039	$^{+0.041}_{-0.044}$	$^{+0.082}_{-0.087}$	$^{+0.123}_{-0.129}$	$^{+0.034}_{-0.037}$
	20–30	$+0.046$	$^{+0.036}_{-0.040}$	$^{+0.071}_{-0.077}$	$^{+0.108}_{-0.114}$	$^{+0.031}_{-0.035}$
	30–50	$+0.054$	$^{+0.058}_{-0.064}$	$^{+0.117}_{-0.124}$	$^{+0.176}_{-0.186}$	$^{+0.055}_{-0.064}$
0.6–1.2	10–12	-0.050	$^{+0.079}_{-0.084}$	$^{+0.152}_{-0.161}$	$^{+0.221}_{-0.230}$	$^{+0.051}_{-0.056}$
	12–16	-0.076	$^{+0.046}_{-0.051}$	$^{+0.096}_{-0.101}$	$^{+0.145}_{-0.149}$	$^{+0.036}_{-0.040}$
	16–20	$+0.008$	$^{+0.045}_{-0.053}$	$^{+0.094}_{-0.099}$	$^{+0.143}_{-0.148}$	$^{+0.040}_{-0.044}$
	20–30	-0.063	$^{+0.043}_{-0.051}$	$^{+0.089}_{-0.096}$	$^{+0.135}_{-0.142}$	$^{+0.039}_{-0.042}$
	30–50	-0.106	$^{+0.059}_{-0.070}$	$^{+0.122}_{-0.133}$	$^{+0.182}_{-0.199}$	$^{+0.058}_{-0.065}$

Table 20: $\tilde{\lambda}$ in the HX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.261$	$^{+0.273}_{-0.294}$	$^{+0.534}_{-0.556}$	$^{+0.796}_{-0.818}$	$^{+0.157}_{-0.174}$
	12–16	$+0.298$	$^{+0.200}_{-0.210}$	$^{+0.400}_{-0.421}$	$^{+0.600}_{-0.610}$	$^{+0.115}_{-0.121}$
	16–20	$+0.219$	$^{+0.172}_{-0.180}$	$^{+0.352}_{-0.352}$	$^{+0.532}_{-0.523}$	$^{+0.137}_{-0.135}$
	20–30	$+0.104$	$^{+0.138}_{-0.139}$	$^{+0.281}_{-0.273}$	$^{+0.423}_{-0.400}$	$^{+0.118}_{-0.121}$
	30–50	$+0.242$	$^{+0.236}_{-0.210}$	$^{+0.485}_{-0.407}$	$^{+0.760}_{-0.590}$	$^{+0.229}_{-0.206}$
0.6–1.2	10–12	$+0.088$	$^{+0.226}_{-0.248}$	$^{+0.445}_{-0.456}$	$^{+0.665}_{-0.664}$	$^{+0.140}_{-0.145}$
	12–16	-0.007	$^{+0.145}_{-0.156}$	$^{+0.296}_{-0.307}$	$^{+0.447}_{-0.450}$	$^{+0.108}_{-0.111}$
	16–20	-0.162	$^{+0.138}_{-0.152}$	$^{+0.294}_{-0.285}$	$^{+0.442}_{-0.419}$	$^{+0.121}_{-0.122}$
	20–30	$+0.238$	$^{+0.154}_{-0.151}$	$^{+0.311}_{-0.299}$	$^{+0.475}_{-0.432}$	$^{+0.139}_{-0.129}$
	30–50	$+0.198$	$^{+0.247}_{-0.219}$	$^{+0.497}_{-0.410}$	$^{+0.772}_{-0.602}$	$^{+0.236}_{-0.208}$

Table 21: λ_ϑ in the PX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.416$	$^{+0.245}_{-0.259}$	$^{+0.485}_{-0.500}$	$^{+0.713}_{-0.716}$	$^{+0.169}_{-0.178}$
	12–16	$+0.491$	$^{+0.177}_{-0.195}$	$^{+0.358}_{-0.376}$	$^{+0.539}_{-0.547}$	$^{+0.119}_{-0.129}$
	16–20	$+0.249$	$^{+0.148}_{-0.160}$	$^{+0.306}_{-0.318}$	$^{+0.464}_{-0.459}$	$^{+0.120}_{-0.126}$
	20–30	$+0.219$	$^{+0.122}_{-0.126}$	$^{+0.249}_{-0.247}$	$^{+0.377}_{-0.361}$	$^{+0.107}_{-0.110}$
	30–50	$+0.414$	$^{+0.190}_{-0.189}$	$^{+0.389}_{-0.359}$	$^{+0.597}_{-0.530}$	$^{+0.181}_{-0.173}$
0.6–1.2	10–12	$+0.174$	$^{+0.214}_{-0.236}$	$^{+0.410}_{-0.432}$	$^{+0.597}_{-0.609}$	$^{+0.124}_{-0.125}$
	12–16	$+0.153$	$^{+0.137}_{-0.149}$	$^{+0.273}_{-0.285}$	$^{+0.410}_{-0.414}$	$^{+0.094}_{-0.098}$
	16–20	$+0.031$	$^{+0.132}_{-0.140}$	$^{+0.269}_{-0.276}$	$^{+0.412}_{-0.398}$	$^{+0.112}_{-0.113}$
	20–30	$+0.461$	$^{+0.129}_{-0.137}$	$^{+0.272}_{-0.266}$	$^{+0.416}_{-0.389}$	$^{+0.116}_{-0.119}$
	30–50	$+0.371$	$^{+0.179}_{-0.179}$	$^{+0.376}_{-0.349}$	$^{+0.574}_{-0.499}$	$^{+0.180}_{-0.168}$

Table 22: λ_φ in the PX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.015	$^{+0.035}_{-0.039}$	$^{+0.071}_{-0.075}$	$^{+0.107}_{-0.111}$	$^{+0.017}_{-0.018}$
	12–16	-0.044	$^{+0.025}_{-0.028}$	$^{+0.053}_{-0.056}$	$^{+0.079}_{-0.082}$	$^{+0.013}_{-0.015}$
	16–20	-0.020	$^{+0.027}_{-0.029}$	$^{+0.054}_{-0.057}$	$^{+0.082}_{-0.084}$	$^{+0.018}_{-0.020}$
	20–30	-0.035	$^{+0.025}_{-0.028}$	$^{+0.050}_{-0.053}$	$^{+0.075}_{-0.079}$	$^{+0.021}_{-0.022}$
	30–50	-0.048	$^{+0.045}_{-0.049}$	$^{+0.091}_{-0.095}$	$^{+0.138}_{-0.141}$	$^{+0.044}_{-0.048}$
0.6–1.2	10–12	-0.034	$^{+0.031}_{-0.034}$	$^{+0.063}_{-0.066}$	$^{+0.095}_{-0.100}$	$^{+0.021}_{-0.024}$
	12–16	-0.057	$^{+0.024}_{-0.027}$	$^{+0.050}_{-0.053}$	$^{+0.076}_{-0.079}$	$^{+0.016}_{-0.018}$
	16–20	-0.065	$^{+0.025}_{-0.029}$	$^{+0.053}_{-0.055}$	$^{+0.080}_{-0.083}$	$^{+0.020}_{-0.022}$
	20–30	-0.067	$^{+0.029}_{-0.033}$	$^{+0.061}_{-0.063}$	$^{+0.091}_{-0.093}$	$^{+0.023}_{-0.025}$
	30–50	-0.049	$^{+0.047}_{-0.054}$	$^{+0.098}_{-0.102}$	$^{+0.146}_{-0.150}$	$^{+0.046}_{-0.050}$

Table 23: $\lambda_{\vartheta\varphi}$ in the PX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.101$	$^{+0.050}_{-0.057}$	$^{+0.105}_{-0.107}$	$^{+0.159}_{-0.160}$	$^{+0.045}_{-0.050}$
	12–16	$+0.020$	$^{+0.038}_{-0.042}$	$^{+0.078}_{-0.083}$	$^{+0.118}_{-0.123}$	$^{+0.030}_{-0.032}$
	16–20	$+0.017$	$^{+0.038}_{-0.042}$	$^{+0.077}_{-0.081}$	$^{+0.116}_{-0.121}$	$^{+0.033}_{-0.035}$
	20–30	$+0.067$	$^{+0.035}_{-0.037}$	$^{+0.070}_{-0.074}$	$^{+0.106}_{-0.110}$	$^{+0.030}_{-0.034}$
	30–50	$+0.086$	$^{+0.057}_{-0.063}$	$^{+0.116}_{-0.122}$	$^{+0.174}_{-0.178}$	$^{+0.055}_{-0.062}$
0.6–1.2	10–12	$+0.093$	$^{+0.069}_{-0.076}$	$^{+0.143}_{-0.146}$	$^{+0.210}_{-0.213}$	$^{+0.050}_{-0.055}$
	12–16	$+0.003$	$^{+0.042}_{-0.048}$	$^{+0.088}_{-0.091}$	$^{+0.131}_{-0.135}$	$^{+0.034}_{-0.036}$
	16–20	$+0.046$	$^{+0.040}_{-0.045}$	$^{+0.084}_{-0.089}$	$^{+0.126}_{-0.130}$	$^{+0.036}_{-0.039}$
	20–30	$+0.090$	$^{+0.038}_{-0.043}$	$^{+0.079}_{-0.084}$	$^{+0.120}_{-0.125}$	$^{+0.035}_{-0.038}$
	30–50	-0.035	$^{+0.061}_{-0.066}$	$^{+0.124}_{-0.126}$	$^{+0.184}_{-0.190}$	$^{+0.058}_{-0.063}$

Table 24: $\tilde{\lambda}$ in the PX frame for the Υ(2S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.327$	$^{+0.270}_{-0.290}$	$^{+0.536}_{-0.557}$	$^{+0.776}_{-0.797}$	$^{+0.165}_{-0.174}$
	12–16	$+0.318$	$^{+0.194}_{-0.213}$	$^{+0.393}_{-0.412}$	$^{+0.591}_{-0.600}$	$^{+0.123}_{-0.124}$
	16–20	$+0.180$	$^{+0.169}_{-0.180}$	$^{+0.347}_{-0.349}$	$^{+0.517}_{-0.510}$	$^{+0.131}_{-0.133}$
	20–30	$+0.113$	$^{+0.132}_{-0.136}$	$^{+0.272}_{-0.270}$	$^{+0.420}_{-0.389}$	$^{+0.118}_{-0.117}$
	30–50	$+0.250$	$^{+0.243}_{-0.215}$	$^{+0.489}_{-0.402}$	$^{+0.758}_{-0.590}$	$^{+0.230}_{-0.205}$
0.6–1.2	10–12	$+0.067$	$^{+0.224}_{-0.241}$	$^{+0.439}_{-0.456}$	$^{+0.655}_{-0.648}$	$^{+0.139}_{-0.136}$
	12–16	-0.001	$^{+0.145}_{-0.159}$	$^{+0.304}_{-0.310}$	$^{+0.456}_{-0.454}$	$^{+0.108}_{-0.111}$
	16–20	-0.146	$^{+0.141}_{-0.146}$	$^{+0.299}_{-0.290}$	$^{+0.449}_{-0.426}$	$^{+0.128}_{-0.125}$
	20–30	$+0.252$	$^{+0.154}_{-0.150}$	$^{+0.310}_{-0.298}$	$^{+0.483}_{-0.438}$	$^{+0.136}_{-0.131}$
	30–50	$+0.200$	$^{+0.246}_{-0.215}$	$^{+0.500}_{-0.421}$	$^{+0.779}_{-0.603}$	$^{+0.242}_{-0.205}$

Table 25: λ_ϑ in the CS frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	−0.097	$^{+0.104}_{-0.112}$	$^{+0.221}_{-0.212}$	$^{+0.332}_{-0.312}$	$^{+0.072}_{-0.056}$
	12–16	−0.183	$^{+0.083}_{-0.088}$	$^{+0.169}_{-0.173}$	$^{+0.259}_{-0.259}$	$^{+0.046}_{-0.041}$
	16–20	−0.134	$^{+0.088}_{-0.093}$	$^{+0.179}_{-0.179}$	$^{+0.275}_{-0.265}$	$^{+0.058}_{-0.054}$
	20–30	−0.158	$^{+0.076}_{-0.085}$	$^{+0.163}_{-0.159}$	$^{+0.246}_{-0.237}$	$^{+0.058}_{-0.053}$
	30–50	−0.245	$^{+0.104}_{-0.107}$	$^{+0.221}_{-0.201}$	$^{+0.345}_{-0.289}$	$^{+0.097}_{-0.085}$
0.6–1.2	10–12	−0.022	$^{+0.167}_{-0.187}$	$^{+0.313}_{-0.333}$	$^{+0.445}_{-0.444}$	$^{+0.076}_{-0.067}$
	12–16	−0.140	$^{+0.085}_{-0.092}$	$^{+0.173}_{-0.180}$	$^{+0.262}_{-0.260}$	$^{+0.051}_{-0.048}$
	16–20	−0.298	$^{+0.072}_{-0.079}$	$^{+0.149}_{-0.148}$	$^{+0.226}_{-0.221}$	$^{+0.048}_{-0.047}$
	20–30	−0.193	$^{+0.079}_{-0.081}$	$^{+0.158}_{-0.157}$	$^{+0.242}_{-0.228}$	$^{+0.060}_{-0.055}$
	30–50	−0.117	$^{+0.124}_{-0.117}$	$^{+0.260}_{-0.222}$	$^{+0.402}_{-0.320}$	$^{+0.113}_{-0.100}$

Table 26: λ_φ in the CS frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	+0.029	$^{+0.163}_{-0.185}$	$^{+0.307}_{-0.344}$	$^{+0.436}_{-0.503}$	$^{+0.074}_{-0.112}$
	12–16	+0.141	$^{+0.097}_{-0.112}$	$^{+0.199}_{-0.219}$	$^{+0.291}_{-0.321}$	$^{+0.050}_{-0.069}$
	16–20	+0.101	$^{+0.077}_{-0.091}$	$^{+0.159}_{-0.182}$	$^{+0.236}_{-0.272}$	$^{+0.056}_{-0.073}$
	20–30	+0.123	$^{+0.058}_{-0.072}$	$^{+0.117}_{-0.138}$	$^{+0.177}_{-0.212}$	$^{+0.049}_{-0.063}$
	30–50	+0.099	$^{+0.079}_{-0.099}$	$^{+0.155}_{-0.192}$	$^{+0.231}_{-0.290}$	$^{+0.073}_{-0.093}$
0.6–1.2	10–12	+0.017	$^{+0.154}_{-0.159}$	$^{+0.276}_{-0.288}$	$^{+0.375}_{-0.405}$	$^{+0.058}_{-0.082}$
	12–16	+0.071	$^{+0.075}_{-0.084}$	$^{+0.152}_{-0.166}$	$^{+0.218}_{-0.243}$	$^{+0.047}_{-0.060}$
	16–20	+0.225	$^{+0.055}_{-0.066}$	$^{+0.110}_{-0.129}$	$^{+0.162}_{-0.193}$	$^{+0.044}_{-0.056}$
	20–30	+0.026	$^{+0.060}_{-0.072}$	$^{+0.121}_{-0.143}$	$^{+0.178}_{-0.214}$	$^{+0.052}_{-0.064}$
	30–50	+0.188	$^{+0.070}_{-0.091}$	$^{+0.145}_{-0.178}$	$^{+0.211}_{-0.273}$	$^{+0.068}_{-0.089}$

Table 27: $\lambda_{\vartheta\varphi}$ in the CS frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.002$	$^{+0.056}_{-0.061}$	$^{+0.117}_{-0.121}$	$^{+0.180}_{-0.182}$	$^{+0.052}_{-0.057}$
	12–16	-0.052	$^{+0.040}_{-0.045}$	$^{+0.081}_{-0.086}$	$^{+0.122}_{-0.129}$	$^{+0.029}_{-0.033}$
	16–20	-0.063	$^{+0.042}_{-0.046}$	$^{+0.084}_{-0.088}$	$^{+0.125}_{-0.131}$	$^{+0.035}_{-0.038}$
	20–30	-0.007	$^{+0.036}_{-0.039}$	$^{+0.074}_{-0.077}$	$^{+0.111}_{-0.115}$	$^{+0.032}_{-0.036}$
	30–50	-0.056	$^{+0.058}_{-0.065}$	$^{+0.118}_{-0.125}$	$^{+0.175}_{-0.185}$	$^{+0.053}_{-0.060}$
0.6–1.2	10–12	$+0.126$	$^{+0.095}_{-0.101}$	$^{+0.194}_{-0.195}$	$^{+0.283}_{-0.275}$	$^{+0.068}_{-0.067}$
	12–16	-0.018	$^{+0.048}_{-0.051}$	$^{+0.098}_{-0.102}$	$^{+0.149}_{-0.148}$	$^{+0.038}_{-0.039}$
	16–20	-0.022	$^{+0.043}_{-0.045}$	$^{+0.086}_{-0.089}$	$^{+0.130}_{-0.133}$	$^{+0.037}_{-0.040}$
	20–30	-0.053	$^{+0.041}_{-0.044}$	$^{+0.080}_{-0.084}$	$^{+0.123}_{-0.123}$	$^{+0.036}_{-0.039}$
	30–50	$+0.081$	$^{+0.065}_{-0.070}$	$^{+0.132}_{-0.137}$	$^{+0.196}_{-0.201}$	$^{+0.060}_{-0.063}$

Table 28: $\tilde{\lambda}$ in the CS frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.020$	$^{+0.386}_{-0.419}$	$^{+0.754}_{-0.770}$	$^{+1.087}_{-1.085}$	$^{+0.222}_{-0.211}$
	12–16	$+0.202$	$^{+0.249}_{-0.268}$	$^{+0.501}_{-0.520}$	$^{+0.753}_{-0.760}$	$^{+0.156}_{-0.149}$
	16–20	$+0.146$	$^{+0.211}_{-0.209}$	$^{+0.432}_{-0.408}$	$^{+0.653}_{-0.607}$	$^{+0.174}_{-0.157}$
	20–30	$+0.192$	$^{+0.172}_{-0.172}$	$^{+0.358}_{-0.331}$	$^{+0.544}_{-0.489}$	$^{+0.156}_{-0.151}$
	30–50	$+0.012$	$^{+0.264}_{-0.217}$	$^{+0.541}_{-0.422}$	$^{+0.842}_{-0.602}$	$^{+0.254}_{-0.212}$
0.6–1.2	10–12	$+0.054$	$^{+0.298}_{-0.323}$	$^{+0.580}_{-0.591}$	$^{+0.848}_{-0.831}$	$^{+0.189}_{-0.178}$
	12–16	$+0.104$	$^{+0.196}_{-0.206}$	$^{+0.407}_{-0.396}$	$^{+0.608}_{-0.577}$	$^{+0.149}_{-0.142}$
	16–20	$+0.454$	$^{+0.209}_{-0.207}$	$^{+0.428}_{-0.405}$	$^{+0.647}_{-0.591}$	$^{+0.189}_{-0.180}$
	20–30	-0.111	$^{+0.160}_{-0.160}$	$^{+0.332}_{-0.315}$	$^{+0.513}_{-0.455}$	$^{+0.151}_{-0.138}$
	30–50	$+0.505$	$^{+0.356}_{-0.263}$	$^{+0.728}_{-0.528}$	$^{+1.135}_{-0.758}$	$^{+0.352}_{-0.264}$

Table 29: λ_ϑ in the HX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.166$	$^{+0.278}_{-0.301}$	$^{+0.561}_{-0.584}$	$^{+0.844}_{-0.852}$	$^{+0.196}_{-0.214}$
	12–16	$+0.404$	$^{+0.202}_{-0.218}$	$^{+0.406}_{-0.422}$	$^{+0.611}_{-0.616}$	$^{+0.143}_{-0.153}$
	16–20	$+0.308$	$^{+0.188}_{-0.196}$	$^{+0.375}_{-0.374}$	$^{+0.572}_{-0.552}$	$^{+0.158}_{-0.156}$
	20–30	$+0.344$	$^{+0.152}_{-0.157}$	$^{+0.307}_{-0.303}$	$^{+0.469}_{-0.441}$	$^{+0.138}_{-0.141}$
	30–50	$+0.349$	$^{+0.213}_{-0.207}$	$^{+0.440}_{-0.400}$	$^{+0.679}_{-0.571}$	$^{+0.202}_{-0.193}$
0.6–1.2	10–12	-0.106	$^{+0.253}_{-0.281}$	$^{+0.492}_{-0.509}$	$^{+0.709}_{-0.714}$	$^{+0.150}_{-0.154}$
	12–16	$+0.226$	$^{+0.155}_{-0.172}$	$^{+0.319}_{-0.328}$	$^{+0.483}_{-0.483}$	$^{+0.116}_{-0.120}$
	16–20	$+0.573$	$^{+0.161}_{-0.171}$	$^{+0.332}_{-0.333}$	$^{+0.502}_{-0.486}$	$^{+0.145}_{-0.146}$
	20–30	$+0.206$	$^{+0.138}_{-0.143}$	$^{+0.283}_{-0.280}$	$^{+0.427}_{-0.403}$	$^{+0.127}_{-0.128}$
	30–50	$+0.389$	$^{+0.215}_{-0.207}$	$^{+0.443}_{-0.400}$	$^{+0.694}_{-0.571}$	$^{+0.211}_{-0.190}$

Table 30: λ_φ in the HX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.035	$^{+0.050}_{-0.056}$	$^{+0.100}_{-0.107}$	$^{+0.148}_{-0.154}$	$^{+0.026}_{-0.028}$
	12–16	-0.065	$^{+0.032}_{-0.036}$	$^{+0.066}_{-0.068}$	$^{+0.097}_{-0.102}$	$^{+0.019}_{-0.021}$
	16–20	-0.043	$^{+0.031}_{-0.034}$	$^{+0.063}_{-0.066}$	$^{+0.095}_{-0.098}$	$^{+0.024}_{-0.025}$
	20–30	-0.032	$^{+0.030}_{-0.033}$	$^{+0.061}_{-0.064}$	$^{+0.092}_{-0.094}$	$^{+0.026}_{-0.028}$
	30–50	-0.098	$^{+0.053}_{-0.059}$	$^{+0.106}_{-0.112}$	$^{+0.159}_{-0.165}$	$^{+0.050}_{-0.057}$
0.6–1.2	10–12	$+0.060$	$^{+0.040}_{-0.047}$	$^{+0.083}_{-0.093}$	$^{+0.125}_{-0.139}$	$^{+0.034}_{-0.040}$
	12–16	-0.033	$^{+0.035}_{-0.039}$	$^{+0.069}_{-0.075}$	$^{+0.104}_{-0.112}$	$^{+0.029}_{-0.033}$
	16–20	-0.030	$^{+0.036}_{-0.040}$	$^{+0.073}_{-0.080}$	$^{+0.111}_{-0.117}$	$^{+0.031}_{-0.035}$
	20–30	-0.106	$^{+0.036}_{-0.039}$	$^{+0.073}_{-0.077}$	$^{+0.111}_{-0.115}$	$^{+0.030}_{-0.034}$
	30–50	$+0.060$	$^{+0.056}_{-0.063}$	$^{+0.115}_{-0.122}$	$^{+0.173}_{-0.183}$	$^{+0.055}_{-0.061}$

Table 31: $\lambda_{\vartheta\varphi}$ in the HX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	-0.060	$^{+0.083}_{-0.093}$	$^{+0.164}_{-0.178}$	$^{+0.241}_{-0.259}$	$^{+0.064}_{-0.074}$
	12–16	-0.033	$^{+0.054}_{-0.060}$	$^{+0.110}_{-0.119}$	$^{+0.166}_{-0.172}$	$^{+0.042}_{-0.047}$
	16–20	$+0.028$	$^{+0.047}_{-0.053}$	$^{+0.098}_{-0.104}$	$^{+0.147}_{-0.152}$	$^{+0.043}_{-0.047}$
	20–30	-0.026	$^{+0.041}_{-0.047}$	$^{+0.085}_{-0.090}$	$^{+0.128}_{-0.134}$	$^{+0.038}_{-0.043}$
	30–50	$+0.040$	$^{+0.066}_{-0.074}$	$^{+0.136}_{-0.143}$	$^{+0.206}_{-0.210}$	$^{+0.064}_{-0.068}$
0.6–1.2	10–12	-0.105	$^{+0.103}_{-0.112}$	$^{+0.197}_{-0.206}$	$^{+0.282}_{-0.286}$	$^{+0.058}_{-0.064}$
	12–16	-0.097	$^{+0.057}_{-0.066}$	$^{+0.115}_{-0.128}$	$^{+0.174}_{-0.186}$	$^{+0.047}_{-0.053}$
	16–20	-0.210	$^{+0.057}_{-0.065}$	$^{+0.120}_{-0.127}$	$^{+0.182}_{-0.187}$	$^{+0.052}_{-0.059}$
	20–30	-0.018	$^{+0.050}_{-0.056}$	$^{+0.099}_{-0.108}$	$^{+0.148}_{-0.159}$	$^{+0.045}_{-0.050}$
	30–50	-0.154	$^{+0.074}_{-0.087}$	$^{+0.154}_{-0.168}$	$^{+0.231}_{-0.248}$	$^{+0.071}_{-0.082}$

Table 32: $\tilde{\lambda}$ in the HX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.064$	$^{+0.347}_{-0.377}$	$^{+0.700}_{-0.713}$	$^{+1.003}_{-1.016}$	$^{+0.203}_{-0.214}$
	12–16	$+0.186$	$^{+0.231}_{-0.255}$	$^{+0.474}_{-0.486}$	$^{+0.705}_{-0.705}$	$^{+0.144}_{-0.151}$
	16–20	$+0.163$	$^{+0.200}_{-0.210}$	$^{+0.416}_{-0.405}$	$^{+0.632}_{-0.588}$	$^{+0.170}_{-0.159}$
	20–30	$+0.232$	$^{+0.169}_{-0.170}$	$^{+0.346}_{-0.339}$	$^{+0.533}_{-0.490}$	$^{+0.158}_{-0.153}$
	30–50	$+0.044$	$^{+0.266}_{-0.219}$	$^{+0.532}_{-0.424}$	$^{+0.835}_{-0.618}$	$^{+0.251}_{-0.213}$
0.6–1.2	10–12	$+0.075$	$^{+0.294}_{-0.312}$	$^{+0.583}_{-0.588}$	$^{+0.845}_{-0.836}$	$^{+0.189}_{-0.186}$
	12–16	$+0.145$	$^{+0.193}_{-0.200}$	$^{+0.385}_{-0.382}$	$^{+0.587}_{-0.555}$	$^{+0.148}_{-0.140}$
	16–20	$+0.461$	$^{+0.205}_{-0.199}$	$^{+0.407}_{-0.390}$	$^{+0.629}_{-0.572}$	$^{+0.182}_{-0.172}$
	20–30	-0.097	$^{+0.158}_{-0.160}$	$^{+0.325}_{-0.309}$	$^{+0.492}_{-0.450}$	$^{+0.144}_{-0.142}$
	30–50	$+0.578$	$^{+0.356}_{-0.286}$	$^{+0.725}_{-0.543}$	$^{+1.127}_{-0.784}$	$^{+0.349}_{-0.261}$

Table 33: λ_ϑ in the PX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	λ_ϑ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	+0.202	$^{+0.307}_{-0.339}$	$^{+0.630}_{-0.646}$	$^{+0.922}_{-0.907}$	$^{+0.216}_{-0.226}$
	12–16	+0.429	$^{+0.217}_{-0.238}$	$^{+0.439}_{-0.449}$	$^{+0.650}_{-0.660}$	$^{+0.148}_{-0.161}$
	16–20	+0.298	$^{+0.181}_{-0.187}$	$^{+0.375}_{-0.372}$	$^{+0.559}_{-0.536}$	$^{+0.157}_{-0.152}$
	20–30	+0.324	$^{+0.150}_{-0.156}$	$^{+0.303}_{-0.294}$	$^{+0.456}_{-0.431}$	$^{+0.133}_{-0.137}$
	30–50	+0.356	$^{+0.210}_{-0.212}$	$^{+0.444}_{-0.401}$	$^{+0.677}_{-0.579}$	$^{+0.202}_{-0.192}$
0.6–1.2	10–12	+0.119	$^{+0.284}_{-0.309}$	$^{+0.527}_{-0.552}$	$^{+0.745}_{-0.758}$	$^{+0.148}_{-0.158}$
	12–16	+0.231	$^{+0.169}_{-0.180}$	$^{+0.339}_{-0.342}$	$^{+0.510}_{-0.504}$	$^{+0.123}_{-0.124}$
	16–20	+0.685	$^{+0.181}_{-0.184}$	$^{+0.368}_{-0.361}$	$^{+0.555}_{-0.530}$	$^{+0.155}_{-0.164}$
	20–30	+0.176	$^{+0.143}_{-0.145}$	$^{+0.287}_{-0.282}$	$^{+0.439}_{-0.419}$	$^{+0.128}_{-0.132}$
	30–50	+0.449	$^{+0.223}_{-0.211}$	$^{+0.465}_{-0.404}$	$^{+0.718}_{-0.585}$	$^{+0.220}_{-0.206}$

Table 34: λ_φ in the PX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	λ_φ	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	−0.040	$^{+0.045}_{-0.048}$	$^{+0.092}_{-0.093}$	$^{+0.134}_{-0.135}$	$^{+0.025}_{-0.024}$
	12–16	−0.056	$^{+0.030}_{-0.033}$	$^{+0.060}_{-0.064}$	$^{+0.090}_{-0.094}$	$^{+0.017}_{-0.019}$
	16–20	−0.034	$^{+0.030}_{-0.033}$	$^{+0.060}_{-0.065}$	$^{+0.092}_{-0.095}$	$^{+0.023}_{-0.025}$
	20–30	−0.030	$^{+0.029}_{-0.031}$	$^{+0.059}_{-0.062}$	$^{+0.089}_{-0.091}$	$^{+0.025}_{-0.028}$
	30–50	−0.093	$^{+0.051}_{-0.058}$	$^{+0.104}_{-0.111}$	$^{+0.158}_{-0.162}$	$^{+0.050}_{-0.055}$
0.6–1.2	10–12	−0.007	$^{+0.036}_{-0.043}$	$^{+0.076}_{-0.084}$	$^{+0.115}_{-0.124}$	$^{+0.029}_{-0.034}$
	12–16	−0.041	$^{+0.028}_{-0.032}$	$^{+0.059}_{-0.062}$	$^{+0.090}_{-0.091}$	$^{+0.022}_{-0.024}$
	16–20	−0.057	$^{+0.032}_{-0.035}$	$^{+0.063}_{-0.067}$	$^{+0.095}_{-0.098}$	$^{+0.027}_{-0.030}$
	20–30	−0.093	$^{+0.033}_{-0.036}$	$^{+0.068}_{-0.071}$	$^{+0.102}_{-0.106}$	$^{+0.028}_{-0.030}$
	30–50	+0.040	$^{+0.058}_{-0.065}$	$^{+0.116}_{-0.123}$	$^{+0.174}_{-0.181}$	$^{+0.054}_{-0.061}$

Table 35: $\lambda_{\vartheta\varphi}$ in the PX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	$\lambda_{\vartheta\varphi}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.016$	$^{+0.066}_{-0.073}$	$^{+0.131}_{-0.142}$	$^{+0.201}_{-0.211}$	$^{+0.059}_{-0.067}$
	12–16	$+0.082$	$^{+0.045}_{-0.049}$	$^{+0.093}_{-0.096}$	$^{+0.140}_{-0.141}$	$^{+0.038}_{-0.041}$
	16–20	$+0.084$	$^{+0.045}_{-0.050}$	$^{+0.094}_{-0.097}$	$^{+0.141}_{-0.144}$	$^{+0.040}_{-0.045}$
	20–30	$+0.021$	$^{+0.040}_{-0.045}$	$^{+0.083}_{-0.087}$	$^{+0.125}_{-0.128}$	$^{+0.037}_{-0.042}$
	30–50	$+0.075$	$^{+0.067}_{-0.074}$	$^{+0.136}_{-0.139}$	$^{+0.208}_{-0.204}$	$^{+0.064}_{-0.067}$
0.6–1.2	10–12	-0.118	$^{+0.091}_{-0.101}$	$^{+0.183}_{-0.192}$	$^{+0.270}_{-0.275}$	$^{+0.069}_{-0.074}$
	12–16	$+0.029$	$^{+0.055}_{-0.059}$	$^{+0.109}_{-0.116}$	$^{+0.166}_{-0.169}$	$^{+0.043}_{-0.047}$
	16–20	$+0.051$	$^{+0.053}_{-0.062}$	$^{+0.111}_{-0.116}$	$^{+0.165}_{-0.170}$	$^{+0.049}_{-0.053}$
	20–30	$+0.066$	$^{+0.044}_{-0.050}$	$^{+0.090}_{-0.096}$	$^{+0.136}_{-0.139}$	$^{+0.041}_{-0.044}$
	30–50	-0.083	$^{+0.074}_{-0.081}$	$^{+0.149}_{-0.161}$	$^{+0.229}_{-0.236}$	$^{+0.069}_{-0.074}$

Table 36: $\tilde{\lambda}$ in the PX frame for the Υ(3S).

$\lvert y\rvert$	p_{T} (GeV)	$\tilde{\lambda}$	total uncertainty 68.3% CL	total uncertainty 95.5% CL	total uncertainty 99.7% CL	stat. unc. 68.3% CL
0.0–0.6	10–12	$+0.077$	$^{+0.366}_{-0.409}$	$^{+0.720}_{-0.729}$	$^{+1.024}_{-1.032}$	$^{+0.216}_{-0.209}$
	12–16	$+0.231$	$^{+0.234}_{-0.258}$	$^{+0.474}_{-0.498}$	$^{+0.713}_{-0.713}$	$^{+0.149}_{-0.153}$
	16–20	$+0.184$	$^{+0.194}_{-0.204}$	$^{+0.409}_{-0.398}$	$^{+0.623}_{-0.582}$	$^{+0.167}_{-0.159}$
	20–30	$+0.224$	$^{+0.165}_{-0.168}$	$^{+0.345}_{-0.330}$	$^{+0.525}_{-0.482}$	$^{+0.152}_{-0.149}$
	30–50	$+0.066$	$^{+0.261}_{-0.225}$	$^{+0.536}_{-0.435}$	$^{+0.851}_{-0.618}$	$^{+0.251}_{-0.216}$
0.6–1.2	10–12	$+0.095$	$^{+0.287}_{-0.309}$	$^{+0.564}_{-0.587}$	$^{+0.829}_{-0.812}$	$^{+0.183}_{-0.178}$
	12–16	$+0.119$	$^{+0.195}_{-0.206}$	$^{+0.386}_{-0.387}$	$^{+0.586}_{-0.567}$	$^{+0.143}_{-0.139}$
	16–20	$+0.489$	$^{+0.201}_{-0.212}$	$^{+0.413}_{-0.402}$	$^{+0.635}_{-0.583}$	$^{+0.185}_{-0.177}$
	20–30	-0.089	$^{+0.163}_{-0.163}$	$^{+0.327}_{-0.317}$	$^{+0.499}_{-0.462}$	$^{+0.141}_{-0.143}$
	30–50	$+0.568$	$^{+0.354}_{-0.289}$	$^{+0.727}_{-0.543}$	$^{+1.133}_{-0.780}$	$^{+0.341}_{-0.275}$

Table 37: Number of Υ(1S) signal events in each kinematical bin. The average p_T and $|y|$ values are also given.

$\|y\|$	p_T (GeV)	$\langle\|y\|\rangle$	$\langle p_T \rangle$ (GeV)	signal yield
0.0–0.6	10–12	0.300	11.0	40962
	12–16	0.296	13.7	49031
	16–20	0.295	17.7	21928
	20–30	0.294	23.5	15485
	30–50	0.299	35.8	3532
0.6–1.2	10–12	0.859	10.9	36508
	12–16	0.860	13.7	43786
	16–20	0.868	17.7	19566
	20–30	0.873	23.5	13989
	30–50	0.876	36.0	3238

Table 38: Number of Υ(2S) signal events in each kinematical bin. The average p_T and $|y|$ values are also given.

$\|y\|$	p_T (GeV)	$\langle\|y\|\rangle$	$\langle p_T \rangle$ (GeV)	signal yield
0.0–0.6	10–12	0.301	10.9	13489
	12–16	0.298	13.8	17477
	16–20	0.294	17.8	8870
	20–30	0.294	23.6	6792
	30–50	0.293	36.1	1721
0.6–1.2	10–12	0.857	11.0	11759
	12–16	0.859	13.8	15318
	16–20	0.868	17.7	7566
	20–30	0.872	23.6	6352
	30–50	0.874	36.1	1634

Table 39: Number of Υ(3S) signal events in each kinematical bin. The average p_T and $|y|$ values are also given.

$\|y\|$	p_T (GeV)	$\langle\|y\|\rangle$	$\langle p_T \rangle$ (GeV)	signal yield
0.0–0.6	10–12	0.302	11.0	7950
	12–16	0.298	13.8	10876
	16–20	0.296	17.7	5787
	20–30	0.295	23.6	4899
	30–50	0.294	36.2	1345
0.6–1.2	10–12	0.856	11.0	6780
	12–16	0.861	13.8	9453
	16–20	0.866	17.8	5059
	20–30	0.873	23.7	4285
	30–50	0.873	36.3	1195